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AN OLD VOLCANIC ERUPTION IN IOWA.

BY CHARLES R. KEYES, DES MOINES, IOWA.

In the extreme northwestern corner of Iowa there is a small area of crystalline rocks commonly known under the name of the Sioux Quartzite or Sioux "Granite." These are the only strata in the State showing any decided traces of being changed through dynamic influences. Everywhere else within the limits of the province the rocks are so horizontal in their position, so undisturbed by mountain-making forces, and so unaltered in lithological characters, that it is generally taken for granted that all the strata in the State are sedimentary in origin and repose essentially as they were originally laid down in the waters of the great interior sea which once occupied the heart of the American continent.

The Sioux quartzite is a hard, vitreous mass with undulating bedding planes. Its geological age is regarded as much greater than that of any other formation in Iowa; not excepting even the old Cambrian sandstone of the northeastern portion of the State.

Although the area of the Sioux quartzite is quite extensive, no other crystalline rocks have been noted in the neighborhood until very recently. It is, then, of considerable interest to know that Professor G. E. Culver has lately discovered in the midst of the Sioux quartzite, of southeastern Dakota, in Minnehaha County, within three miles of the Iowa boundary, a large mass of trap, which extends for more than a mile along one of the tributaries of the Big Sioux River. A microscopical examination of these rocks shows it to be a well-pronounced, coarse-grained, olivine diabase, with such minerals as hornblende, black mica, and apatite present in addition to the feldspar, augite, and olivine.

The presence of this massive basic rock of unmistakable eruptive origin is very suggestive of the agencies that have been at work to some extent in changing the old sandstone. Further investigations will doubtless disclose other similar types of intrusive rocks in the Sioux quartzite in all three of the States already mentioned.

But the occurrence of this black trap rock, which has undoubtedly been cooled from a molten condition, is made even more interesting by other discoveries of still more recent date. During the past few years a number of deep wells or borings have been made at different places in northwestern Iowa. The depths reached are from 1200 to 2000 feet. Several of these borings are of special interest, inasmuch as they pass through all of the sedimentary rocks into the crystalline beds below, penetrating them in some cases to the extent of several hundred feet. A typical gray granite has been recognized in some instances; in others different types of eruptive rocks. One of the latest borings in this part of the State is the well at Hull, in Sioux County. At a very considerable depth a number of beds of flint-like rock were passed through. The different layers were separated by sand and gravel several feet in thickness, if the records are to be relied upon. Some of the flint-like fragments were sliced by Mr. S. W.

Beyer of the Iowa Agricultural College, and upon microscopical examination proved to be what is known to geologists as quartz-porphyry—a truly igneous rock or lava, very acid in character, and essentially identical with granite, but cooling under somewhat different physical conditions.

The presence of the several sheets of quartz-porphyry, which are to be regarded as different lava flows, show conclusively that volcanic forces were very active in northwestern Iowa in ancient times. The position of the lava beds seems to indicate, as will be pointed out by Mr. Beyer in his discussion of the subject in the forthcoming Annual Report of the Iowa Geological Survey, that the flow of the molten rocks probably took place toward the close of the Carboniferous age, immediately after the coal of the Mississippi basin had been deposited.

Mr. Beyer puts forward, therefore, two explanations:—

1. That the flow took place during palaeozoic time, perhaps in the Carboniferous, the lava being secularly poured out over an old sea-bottom.
2. That, as a whole, the different flows were contemporaneous and in point of time post-Carboniferous. In this case the intercalations are to be regarded as the results of the subterranean lava flows—the lava following along lines of least resistance and flowing between the strata.

It makes little difference which of these two views is accepted, for certain it is that here in northwestern Iowa there is every reason for believing that there were at one time active volcanic agencies at work not unlike those seen to-day in southern Europe, around the shores of the Mediterranean Sea.

THE PERMIAN IN PRINCE EDWARD ISLAND.

BY F. BAIN, NORTH RIVER, P. E. ISLAND.

The study of the Permian in North America hitherto has not been satisfactory. The areas studied west of the Mississippi and in Virginia exhibit the lower part of the formation which in organic remains so closely resembles the Upper Carboniferous that a clear and satisfactory periodic distinction is not observable. In the Gulf of St. Lawrence, however, where a long-continued and regular subsidence marked the close of the palaeozoic, we have a perfect series of the Permian strata, three thousand feet in depth, recording the gradations of life in this district between the close of the Carboniferous proper and the beginning of the Mesozoic.

The Island of Prince Edward, in the southern part of the Gulf of St. Lawrence, is composed of red sandstones and shales, mostly Permian, capped in the central district by a denuded fragment of the Trias. Where these Permian beds stretch across the Northumberland Strait and appear on the coast of New Brunswick, they are seen to repose unconformably on the Carboniferous. Here the distinction between the two formations is very apparent. The Carboniferous is a coarse, gray marsh deposit, bearing numerous remains of *Calamites* and *Cordaites* and a few *Lepidodendra*. The Permian consists of fine, red marine deposits, bearing as their characteristic organisms *Walchia*, *Tylocladus*, *Baiera*, *Pecopteris arborascens*, and *Calamites gigas*.

In the lower part of the Permian the flora has marked Carboniferous affinities, but there is always a clear and distinct difference. On St. Peter's Island, for example, there is a marsh deposit of the Permian. The gray and brown sandstones and gray bleached clays contain but few calamites, and these of small size, except the giant *C. gigas*. *Cordaites* is also inconspicuous, but remains of *Tylocladus* and *Walchia* are in great profusion, and *Annularia* frequent. At Gallas Point there is the same abundance of *Tylocladus* and *Walchia* with *Dadoxylon* and *Pecopteris*, and here, as in the other localities, *C. arenaceus* begins to take precedence of the older Carboniferous calamites. At Mimimigash is an extensive fern deposit in red clay shale. *Pecopteris arborascens* is abundant and is in magnificent development. Its great, heavy fronds are seen nine feet in length, and its features rich and well developed. *Alethopteris nervosa* is common, but *Spheopteris*, *Neuropteris*, and *Cyclopteris* are sparsely represented. *Annularia* is abundant. *Cordaites* and *Calamites* hold a minor

place, but *Equisitum rogersii* is in magnificent development, and branchlets of *Walchia* everywhere in abundance.

In the Upper Permian about Charlottetown, the Carboniferous features of the formation are almost lost. *Dadoxylon*, *Tylocladon*, *Walchia*, *Palissya* and *Baeria* mingle with *Voltzia*, *Pterophyllum*, *Podozamites*, *Clathropteris*, ferns of Mesozoic type, and abundant *Equisetaceæ*.

At Carleton a bressiated conglomerate contains many osseous fragments of considerable size, which in structure have a reptilian aspect.

This series of deposits appears to have closed in an important glacial period, for on its summit rests not only drift fragments, which must have come from the distant hills of New Brunswick, but a well-marked glacial moraine, now consolidated into a firm mass of conglomerate five hundred yards in length, occurs in the valley of the Mill River, reposing on the summit of the Permian and underlying the horizontal Trias.

The Trias contains no good deposits of plants, but such remains as we find are quite distinct from those of the underlying formation. Even the ubiquitous *Walchia gracilis* has disappeared and a new form taken its place. *Voltzia*, *Palissya*, *Baeria* mingle with a few inferior *Cycads*, and the accumulations of the ancient sand reefs are everywhere penetrated by the repent stems of *Equisetaceæ* and their peculiar bulbous nodes.

This meagre flora is but the representative of Mesozoic plant life when the district was recovering from the desolation of a great glacial period. Later deposits are entirely wanting, but the chance occurrence of a high-typed Mesozoic reptile, the *Bathygnathus borealis* (Leidy), in these early beds, clearly establishes their systemic standing. The whole of this series of deposits is exceedingly interesting as illustrating the transition of plant life from the Carboniferous to the Triassic.

NOTES ON THE WING-COLOR OF NORTH AMERICAN LOCUSTS BELONGING TO THE SUB-FAMILY CEDIPODINÆ AND ITS SEEING RELATION TO CLIMATIC CONDITIONS.

BY LAWRENCE BRUNER, STATE UNIVERSITY, LINCOLN, NEB.

ONE of the many features that have been noted in the study of our North American locusts during the past ten or a dozen years is the color-variation of the wings of the different species of locusts of the sub-family *Cedipodinæ*. As all students know who have had anything to do with these insects, some have yellow, others orange, still others red, and a very few have their wings blue. While this is true, perhaps it has not been generally noted that the presence or absence of humidity seems to have some influence upon these color-variations in the different representatives of this group that are to be met with throughout the country. That such must be the case, I think there can be no doubt. But little investigation is necessary to show that along the Atlantic slopes and even in the interior of the continent as far westward as the eastern edge of the great plains, red or orange is the characteristic color. On the plains and in other arid districts of the west and southwest the red and orange give place almost entirely to yellow. In the mountains red re appears, while at a certain elevation and under peculiar conditions blue takes the place of both. In some species we find both red- and yellow-winged individuals. There are also those in which yellow- and blue-winged individuals occur. Nor are these wing-color variations confined strictly to special genera. We find both the red and yellow appearing in species of *Arphia*, *Hippiscus*, *Derotemma*, *Trachyrhachis*, *Psinidia*, *Lactista*, *Tomonotus*, *Dissosteira*, etc.; while the blue and yellow are common to representatives of *Leprus* and *Trimerotropis*.

We find the red-winged species most common in humid regions, the yellow-winged in more or less arid regions. In the United States the blue-winged forms are found chiefly in mountainous regions just between the dry and wet conditions. At Pueblo, Colorado, *Leprus wheeleri* occurs with either blue or yellow wings. Near Ogden and Salt Lake City are found both this species and *Trimerotropis cyaneipennis*. They occur most

abundantly a little below the upper shore-line of the ancient Lake Bonneville, and from that point up and down the mountain slopes for several hundreds of feet. Below there are to be found yellow-winged species of *Trimerotropis*, above red-winged *Arphias*. Blue-winged locusts are also to be met with on the lava beds of the Snake River Plains, on the alkali flats of portions of Montana, Wyoming, Nevada, and California, and in the Coast Range of mountains in southern and Lower California.

This same variation in wing-color among the representatives of the sub-family was also observed in Mexico, where the writer had an opportunity of visiting a number of different regions from which specimens were secured. The dry interior contained most yellow-winged and the humid "tierra calientes" furnished most red-winged species; while the midway mountain regions were the characteristic home for a blue-winged locust.

The following species are found with both red and yellow wings, viz.; *Hippiscus tuberculatus*, the prevailing color red, but in the Big Horn Mountains of Wyoming yellow-winged specimens are not uncommon. *Hippiscus*, here in Nebraska, seems to furnish about an equal number of specimens of each color. A couple of others of the genus are known to have the same wing variations. *Psinidia sacerata* in the East is normally red-winged, but in the West is yellow-winged. Two of our *Arphias*, at least, have either red or yellow wings, while *Trachyrhachis pardalina* may be either the one or the other—the red being most common eastward and the yellow-winged westward upon the plains, and red again in the Sierra Nevadas.

So characteristic does this variation in color of the hind wings of these insects appear, that I have about come to the conclusion that an examination of a fair representative collection of these insects would be a sufficient index of the climate of the region from where they came. Possibly I may be wrong. If so, I would be pleased to hear the views of others who have made this feature more of a study than I have.

CURRENT NOTES ON ANTHROPOLOGY.—XXIV.

[Edited by D. G. Brinton, M.D., LL.D.]

The Problem of Life.

"LE Problème de la Vie"—such is the title of the latest work of that thoughtful and learned writer, the Marquis de Nadaillac. The great and serious theme he has chosen is handled with a masterful acquaintance with facts and a severely critical spirit. The sweep of his horizon is most extended. He begins with a statement of the possible methods of formation of the terrestrial globe, the first appearance of organic life upon it, and the succession of animal and vegetable organisms which have one after another occupied its surface, down to the beginning of the quaternary period. These questions fill about one-half of the three hundred pages of the volume. The remainder is an anthropologic study. The antiquity of man, the growth of his physical powers and intellectual faculties, and his identity throughout all ages, are the points which receive especial consideration.

The results of this long and patient research are unfortunately negative. "We must resign ourselves to the avowal that science can teach us nothing either about the first appearance of organized beings on the earth, or about their succession in time, or their rapid multiplication in space" (p. 176). "I look as vainly down the vista of the unmeasured past as I do in the present for any positive evidence of the evolution of organisms or the transformation of species" (p. 178). "As far as we wander, as widely as we search, everywhere the individuals of each species reveal the same uniformity of action, the same psychical fixity." Man alone shows the power of indefinite progress. "Before such facts, who will pretend that man and beast ever sprang from one common ancestry?"

Such is the author's conclusion.

The Early Iron Age in Central Europe.

With the general employment of iron, a new era arose in central Europe, one which gave birth to that high culture which has since focussed there the civilization of the world. An intense